I left Chatham on September 1st for Tower Island. This island was very interesting, having never been visited before. Creagrus was found there in great numbers, breeding, besides Fregetta, Sula, and Phæthon. Of Fregetta a considerable number of embryos and nestlings were procured. Of land birds the following species were found: Geopiza, two species; Cactornis, one species; Nesomimus, one species; Certhidea, one species; Dendrœca, one species; the dove and owl were also observed. Not a single specimen of Tropidurus was seen; Amblyrhynchus is frequent, but small.

From Tower we went to Bindloe. All the birds collected by Dr. Habel were also obtained. Tropidurus is very common, and quite distinct from the Abingdon form. Nesomimus, which had not been recorded before from this island, is a very abundant bird.

On Abingdon we remained only a very short time. Nothing new is to be added to the results of Dr. Habel and the "Albatross."

We reached Guayaquil September 16th, and sailed to Panama on the 19th on the "Santiago."—G. BAUR, *Clark University.*

## GEOLOGY AND PALEONTOLOGY.

**The Desert Sandstone of Australia.**—A paper by Mr. Charles Chewings, published in the Proceedings of the Royal Geographical Society, June, 1891, contains the following interesting account of the "desert sandstone" of Central Australia:

"At what period or periods the Lake Eyre depression was formed has not yet been satisfactorily decided; but we may fairly conjecture that an opening at one time existed to the south into Spencer's Gulf. During Cretaceous times, however, that and all other outlets were things of the past, and the detritus from the Macdonnell and James ranges, as well as many other high lands, was washed into this large basin, of which, so far as ascertained at present, the outline extends from the Coast range, situated a little south of the Gulf of Carpentaria, westward nearly to the overland telegraph line. It then runs northeast towards Lake Eyre, and, skirting the Macdonnell ranges elevation, curves round to the north of the Charlotte Waters telegraph station, in about the latitude of Lake Amadeus, which lake it approaches, if not includes. This is probably the western boundary of this system.

"From Lake Amadeus the Lake Eyre system extends northeasterly towards Port Augusta, takes a curve to the eastward, and runs along

east and west a few miles to the south of Lake Eyre. It then makes southeasterly for Barrier, and taking a long sweep to the east and north embraces the extent of those rivers that flow from south of the Gulf of Carpentaria into Lake Eyre. The shape is semicircular, and crescent-shaped, extending towards a half moon. No doubt detritus from the extensive area covered by the already-mentioned red sandstone formation contributed largely towards filling it up to a level much higher than the present level of the country; this is easily seen by the numerous tent-hills and table-lands scattered throughout the area of the basin, ranging from 200 to 500 feet high, of which Chamber's pillar is a remnant. As the basin sank, or surrounding land became elevated, so the flood waters carried this newer Cretaceous formation to the lowest depression, cutting deep gullies and wide waterways through the newer deposits, and generally lowering the basin. This has been going on probably from time immemorial; certainly from Cretaceous (secondary) age, down through Tertiary and Quaternary ages to the present time. When the seas that washed the softer and newer deposits away from the Macdonnell ranges and laid bare much of the primary rocks had subsided, and Central Australia was elevated quite above sea-level, and long ages of scorching summers had evaporated its larger lakes and surface waters, and the Cretaceous age (during which Lake Eyre was an inland sea) was rapidly becoming a thing of the past, a newer influence, and one that exists to-day,—viz., that of the wind,—probably blew into all secluded and rock-bound spots, depressions, shallow lakes, and like places the sandy weatherings from around their base, and a newer formation was the result. This is the commonly called 'desert sandstone,' for what reason I have never had a satisfactory explanation. Both as a shallow-water deposit and a dry wind-blown deposit it retains its unmistakable characteristics. Its color is that of an ordinary grindstone, and it consists of horizontal layers, the cap of each being harder than that underneath it. By weathering its sides get hollowed out, and in the caves thus formed the aborigines find a refuge from the extremes of weather, often painting devices on the walls.

"The great extremes of heat and cold, a dry atmosphere, and strong winds caused through radiation, tend to constant degradation of the rocks, the detritus being blown into sand-hills and distributed throughout this large area. In Western Australia, along the line of route taken by the Hon. John Forrest, surveyor-general of Western Australia, in lat. 26° S., a sandstone is met with that covers all other rocks from E. long. 122° to E. long. 126° 30′. In this extensive area of 'desert sandstone' all the rising ground is composed of it. 'Very often one

side of the rise forms a cliff.' Further to the north the late Colonel Warburton found this same sandstone formation taxed his camels to the utmost. In the eastern colonies a desert sandstone exists, but whether similar to that in Western Australia, I cannot say. Mr. Woodward has satisfied himself that this formation overlies most, if not the whole of the western coast formations from Cambridge Gulf to King's Sound, and that it extends far inland towards Central Australia.

"Under this sandstone formation the Carboniferous series he describes as well developed, and if it continues right across the continent, as it does in China, coal deposits may yet be found in the interior of Australia. He has also discovered a large lava flow in the northwest, and fixes the Leopold range as of Carboniferous age; also that the coast of Western Australia is rapidly rising, and he describes the sandstone area as extending inland 'as a vast table-land of from 1,000 to 2,000 feet above sea-level. No volcanoes exist in the colony of Western Australia, and the general appearance of the country throughout indicates a condition of remarkable quiescence, continuing even further back than the Carboniferous epoch.' He describes the rivers, for the most part, as 'simply immense storm-water channels. Several large rivers have their sources in the western edge of this plateau, and cutting deep gorges through their upper horizontally bedded rocks, expose the underlying crystalline rocks across the strike of which they have cut their channels,' and considers that 'precious stones may be found in the amygdaloid regions. The mineral-bearing districts have been greatly decomposed and altered by thermal waters and steam at the time of the deposition of the lodes, and later by the heat evolved by the oxidation of the metallic sulphides.' He corroborates the opinion that the uppermost or desert sandstone is of terrestrial origin, and probably formed shortly after the elevation of this continent. In places these beds are of terrestrial origin, there is not the slightest doubt; in other places the indications point to a swampy or lacustrine source."

**Structure of the Piedmont Plateau.**—Prof. Williams, of Johns Hopkins University, offers the following hypothesis as to the structure of the Piedmont region in Maryland:

"That the eastern area is composed of rocks far more ancient than the western, which extend out under these, forming the floor upon which they were deposited; and that although already much folded and metamorphosed, this crystalline floor underwent at least one more folding after the schists had been laid down, carrying these with it and

involving them in a considerable but not an extreme amount of disturbance and metamorphism."

The hypothesis seems to account for the difference between the rocks of the two areas and for the abruptness of their contact, while at the same time it explains the conformity along this contact, and the fact that this boundary and the axes of the synclinals are not coincident. (Bull. Geol. Soc. Am., Vol. II., pp. 301–322, pl. 12.)

**The Triassic of Massachusetts.**—Mr. Benjamin Emerson does not accept the theory that the Triassic deposits of Massachusetts are, as a whole or in part, of glacial origin, but that they result from currents. This will explain the sudden and irregular transitions from coarest to finest sediments, and the derivation of many of the coarse beds from rocks not known in place among the crystallines of the surrounding region. He believes the region to have been a narrow bay, with tides that swept up the eastern and down the western side, and left the center of broad, shallow mud-flats at a considerably higher level than the shoreward portion, so that they alone were regularly abandoned by the water at low tide. It follows from this that the deposits were contemporaneous, and this is shown by the position of the trap sheets. (Bull. Geol. Soc. Am., Vol. II., pp. 451–456, pl. 17.)

**The Relations of the Traps of the Newark System in New Jersey.**—Mr. N. H. Darton makes known the following facts:

"The trap outcrops inclosed by the Watchung Mountains of Northeastern New Jersey, and the outlying mass near New Germantown, are lavas, contemporaneous with the inclosing sediments, while all the other traps described are intruded sheets and dikes.

"The igneous rocks are basalts, the eruptives are fine-grained and generally somewhat glassy, and the intrusives are coarser-grained, generally being dolerite, in some cases including considerable biotite and often near gabbro in structure.

"The great hooks characterizing the southernmost outcrops of the Watchung traps are mainly due to flexure, and the bowed course of their northern terminations and of Towakhow Mountain are due to the same cause." (Bull. U. S. Geol. Surv., No. 67.)

**The Iron Ore District of East Texas.**—The second annual report, 1890, of the Geological Survey of Texas contains an interesting account of the iron ore district of East Texas, by Mr. E. T. Dumble. The territory described lies east of the 96th degree of longitude and north of the 31st parallel of latitude. From this area is

excluded, as being non-iron-bearing, the portion north of Sulphur Fork, and also the northwestern corner, in which the black waxy prairies of the Cretaceous are the prevailing formation.

In this district, so restricted, there are nineteen counties, containing in the aggregate 14,430 square miles. In each of these counties iron ore exists in greater or less quantities and of varying qualities.

The region is underlaid for the most part by strata of Cenozoic age. In only a few places are there exposures of Cretaceous strata, and when they do appear as inliers they belong to its uppermost members and are accompanied by salines.

**Meniscotheriidæ and Chalicotherioidea.**—The Meniscotheriid family of Condylarthra, which has been found only in the American Wasatch, and is represented by a single genus, has always been placed in a very doubtful phylogenetic position. Dr. Wortman in 1886[1] was inclined to "regard Meniscotherium as the direct ancestor of the Hyracoidea, notwithstanding their wide separation in time and space." Schlosser in the same year[2] recognized the striking likeness of the molars of Meniscotherium to those of Chalicotherium, which was at the time believed to be a true perissodactyl, so that he naturally did not trace any ancestral relationship between these forms. He considered Meniscotherium (*op. cit.*, p. 120), with Macrauchenia, to be Perissodactyla which had retained a very primitive foot structure. Since this paper was published Chalicotherium has been removed to a separate division of Mammalia, affiliated to the Perissodactyla, but representing a distinct line.

I find there are many striking resemblances between the dentition of Meniscotherium and Chalicotherium, and it appears to me probable that the Wasatch genus is related to the ancestral forms of Chalicotherium. The resemblances consist (*a*) In the enlargement of the posterior half of the dental series, and reduction of the anterior half. (*b*) The upper molars are of precisely the same pattern; the protocone is isolated; the hypocone and metaconule are united in a short transverse crest. (*c*) The similarity in the lower molars is seen especially in the reduplication of the metaconid in both forms, and the absence of the third lobe upon the last lower molar.

The differences between these genera are such as separate many higher from lower types, in the displacement of the foot bones and

[1] "Comparative Anatomy of the Teeth of the Vertebrata," p. 476.

[2] "Beit. z. Kennt. Niss der Stammes-geschichte d. Hufthiere," *Morph. Jahrb.*, Band 12, p. 21.

evolution of the teeth. Chalicotherium shows a diplarthrous condition of both carpus and tarsus and no fibulo-calcaneal facet; there is no third trochanter; the anterior intermediate cusps of the upper molars (protoconule) is reduced.

We shall remain in the dark as to the truth of this suggestion until we find the complete feet of Meniscotherium. In the meantime the striking resemblances seen in the teeth point strongly towards a distant relationship between these forms.—HENRY F. OSBORN, *American Museum of Natural History, New York, August 27th, 1891.*

**The Family of Astrapotheriidæ.**—Senor Alcides Mercerat has recently published a paper on the Astrapotheriidæ, to which he refers two new genera, Listriotherium and Xylotherium, as well as Burmeister's genus, Astrapotherium. Listriotherium is represented by two new species: *L. patagonicum* Merc., from the Eocene of Monte Leon, and *L. filholii* Merc., from the Eocene of Santa Cruz. Xylotherium has but one representative, *X. mirabile* Merc., also from the Eocene of Santa Cruz. To Astrapotherium belong *A. patagonicum* Burm., *A. augustidens* Merc. sp. nov., *A. marshii* Merc. sp. nov., *A. gaudryi* Merc. sp. nov., all from the Eocene of Mt. Leon, Patagonia; also *A. magnum* Owen, *A. burmeisterii* Merc. sp nov., *A. robustum* Merc. sp. nov., from Santa Cruz, Patagonia, and *A. voghtii* Merc. sp. nov., from the Eocene of Chubut. (Extr. Rev. Mus. de la Plata, Tomo I.)

**On a Skull of the Equus excelsus Leidy, from the Equus Bed of Texas.**—I have received from my valued correspondent, William Taylor, a skull of the *Equus excelsus*, which is of much interest as the first that has come to light in the United States. It lacks only the posterior and inferior walls of the brain-case, and the premaxillary region was detached in such a way that its length is not absolutely certain, though contact of the adherent matrix was found. This skull shows that the *Equus excelsus* is intermediate in characters between the horse and the quagga and allied species, and possesses some Hippidium characters in addition. The resemblance is, however, greater to the quagga. This is shown by the shortness of the premaxillary region, the abbreviation of the maxillary posterior to the last molar, and the long excavation of the posterior nares, which extends to the line of the anterior border of the penultimate superior molar. It differs from both of these species in the posterior prolongation of the vomer over the presphenoid, and in the small size of the last superior molar. The latter tooth is smaller than

the penultimate, as in the species of Hippidium and the three-toed horses. The glenoid surface of the squamosal is of nearly uniform width, as in the Hippidiums, and not expanded at the external extremity, as in the horse and quagga. The *E. excelsus* differs from the quagga in the very slight decurvature of the symphyseal portion of the premaxillary bone. It approaches nearer the horse, but is even flatter. The incisor teeth do not exhibit the anterior longitudinal grooves of the crown seen in the two recent species mentioned. The patterns of the crowns of the superior molars are much like those of the two species named, but the internal inflections of the anterior and posterior borders of the external lakes are not so deep as in one or both of those of the *E. quagga* and *E. caballus*. The size of the skull is about that of the quagga.

The skull is that of an adult female. The frontal bone is crushed in between the orbits so as to crush the descending anterior plates of the former behind the nasal cavity. The free orbital borders and the parietal bones are not crushed. It is singular that that part of the arch of the skull which presents the strongest resistance to pressure is crushed, while the weaker regions remain entire. Unless a stone occupied the exact position calculated to produce this result, it might be imagined that this horse was knocked in the head with a stone hammer, such as has been found in the same bed by Mr. Taylor.—E. D. COPE.

**The Glacial Deposits at Hendon, England.**—In a paper read before the London Geological Society, May 27th, 1891, Mr. Henry Hicks showed that glacial deposits had been spread out to a much wider extent over the Hendon plateau than had hitherto been supposed. There is evidence to show that these deposits have extended in a south and southwest direction across the Brent and Silk valleys, and now occur on most of the heights in the parishes of Kingsbury and Willesden. As the sands, gravels, and boulder clay which cover the Hendon plateau are found to rest on an undulating floor of London clay, the author considers it clear that the main physical features of this portion of Northwestern Middlesex were moulded at a very early stage in the Glacial period, and before the so-called middle sands and gravels and overlying upper boulder clay were deposited. At this time there could have been no barrier of any importance to prevent these deposits from extending into the Thames valley, and the evidence clearly points to the conclusion that the implement-bearing deposits on the higher horizons in the Thames valley should be

classed as of contemporaneous age with the undoubted glacial deposits at Hendon, Finchley, and on the slopes of the Brent valley. Mr. Hicks is therefore satisfied that man lived in the neighborhood of the Thames valley in the early part of the Glacial period, probably in pre-Glacial times. (*Geol. Mag.*, July, 1891.)

## BOTANY.

**Botany at the Washington Meetings.**—From the 12th until the 29th of August there were almost constant sessions of scientific men in Washington at which botanical papers were presented. In the first place, the Association of the American Agricultural Colleges and Experiment Stations held a four days' convention, and during the opening session there was a report from the chairman of the botanical section of the work done at the various stations by the botanists thus employed. It was evident from this report that while systematic botany, making of collections, and the field study of various plants were important features, the main one in several states is the study of the fungous enemies of cultivated crops. In the meetings of the section of botany much time was spent in a consideration of the question of an exhibition to be made by the stations at Chicago in 1893. The work in botany will be divided, and those workers best able to exhibit fungi of the cereals will have them in charge, while others take the fruits, etc. Professor Tracy, of Mississippi, is chairman of the Botanical Committee of the Columbian Exhibition.

Professor Atkinson presented a paper upon the cotton fungi, and exhibited several oil paintings of diseased leaves showing the rust, blight "frenching," etc. The question of the importance of common names for fungi came up, and was discussed, with the conclusion that finely illustrated bulletins are the best way to overcome the difficulty. Professor Alwood presented two papers, one upon an apple-leaf blight which is very destructive in Virginia, and the results of his successful crossing of wheats. Many specimens of the latter were shown, and a lengthy discussion followed. A bacterial disease of the cabbage was reported upon by Professor Garman, while Professor Crandall exhibited a quantity of Rocky Mountain June berries, and spoke of them as one of the coming fruits for Colorado. Professor Brewer exhibited some hybrid butternuts, and Professor Halsted presented a paper upon the germination of spores of species of fungi.

During the sessions of the College and Station Association, Mr. R. Worthington, F.C.S., of Rothamsted, England, delivered six lectures,